

# PATENT ABSTRACTS OF JAPAN

(11) Publication number : 09-263688

(43) Date of publication of application : 07.10.1997

(51) Int.Cl.

C08L 67/02  
B29D 29/06  
D01F 1/09  
D01F 6/62  
D01F 6/62  
D01F 6/92  
D01F 8/14  
D03D 1/00  
D03D 15/00  
D21F 7/08

(21) Application number : 08-073949

(71) Applicant : TORAY IND INC  
TORAY MONOFILAMENT CO LTD

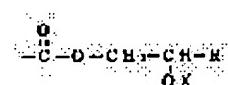
(22) Date of filing : 28.03.1996

(72) Inventor : MASUDA TOYOHIKO  
MAEDA YUHEI  
HORII KEI  
KINOSHITA AKIRA

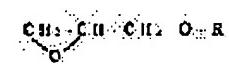
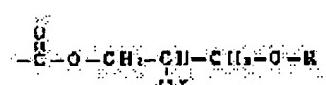
## (54) POLYESTER COMPOSITION, MONOFILAMENT AND WOVEN FABRIC FOR INDUSTRIAL USE

(57) Abstract:

**PROBLEM TO BE SOLVED:** To obtain the subject composition consisting of a polyester having a terminal group having a specific structure and containing an electroconductive material, equipped with both excellent electroconductivity and resistance to hydrolysis, and useful for a monofilament, a drier canvas for a paper making, etc.



**SOLUTION:** This polyester composition consists of a polyester containing  $\geq 5/106g$  at least one kind terminal group of formula I or II (R is H, N-methlenephthalimide, a 1-20C alkylphenyl, etc.; X is H or carbodiimide reacted residue), 0.005-1.5wt.% unreacted carbodiimide compound and an electroconductive



material (preferably 4-15wt.% electroconductive carbon black) and having  $\leq 108\Omega\cdot\text{cm}$  specific resistance. The unreacted carbodiimide is preferably N,N'-di-2,6-diisopropylphenylcarbodiimide. Further, in order to obtain the composition, the polyester is melt mixed and kneaded with at least one kind of epoxy compounds of formula III and IV and the electroconductive carbon black, and then with the carbodiimide compound.

---

## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

\* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

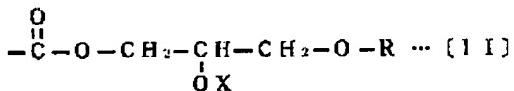
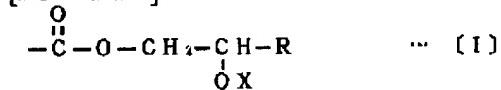
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

**CLAIMS**

[Claim(s)]

[Claim 1] It is /106 g 5Eq about at least one sort of end groups as which polyester is expressed in the following general formula [I] or [II]. 0.005 - 1.5 % of the weight and the conductive matter are contained for an unreacted carbodiimide compound, and specific resistance is [ the above and ] 108. Polyester constituent which is below omega-cm.

[Formula 1]



(R in a general formula [I] and a general formula [II] expresses a hydrogen atom, an N-methylene-phthalimide machine, an N-methylene-alkylation phthalimide machine, an N-methylene-alkoxy substitution phthalimide machine, an N-methylene-halogenation phthalimide machine, the alkyl group of carbon numbers 1-20, a phenyl group, an alkylation phenyl group, an alkoxy substitution phenyl group, a phenyl substitution phenyl group, a halogenation phenyl group, and a cycloalkyl machine, and X expresses a hydrogen atom and a carbodiimide reactive residue.)

[Claim 2] The polyester constituent according to claim 1 which contains conductive carbon black four to 15% of the weight as conductive matter.

[Claim 3] The polyester constituent of the claim 1 whose unreacted carbodiimide compounds are N, N'-G 2, and 6-diisopropyl phenyl carbodiimide - a claim 2 given in any 1 term.

[Claim 4] polyester -- the jib of a polyethylene terephthalate, a polybutylene terephthalate or a butylene terephthalate unit, a butylene isophthalate unit, and an aliphatic dicarboxylic acid -- the polyester constituent of the claim 1 which is a kind at least - a claim 3 given in any 1 term chosen from the copolymerized polyester which consists of a CHIREN ester unit

[Claim 5] The monofilament which consists of a constituent of a claim 1 - a claim 4 given in any 1 term.

[Claim 6] The monofilament according to claim 5 which a monofilament is sheath-core compound thread and is a sheath-core compound monofilament which a sheath component becomes from the polyester constituent of a claim 1 - a claim 4 given in any 1 term, and becomes from the polyester of this sheath-core compound thread with which a heart component contains an unreacted carbodiimide compound 0.005 to 1.5% of the weight at least.

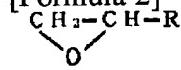
[Claim 7] Industrial use textiles some of woof which constitutes textiles, or whose warp [ at least ] are the monofilaments of a claim 5 - a claim 6 given in any 1 term.

[Claim 8] Industrial use textiles according to claim 7 whose industrial use textiles are paper-making dryer canvas, the network conveyer for the thermal bond method nonwoven fabric heat adhesion

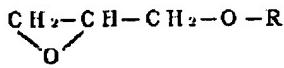
processes, a filter for screens, and a belt for conveyance in a dryer.

[Claim 9] The manufacture method of the polyester constituent characterized by carrying out melting kneading with a carbodiimide compound after carrying out melting kneading of at least one sort of epoxy compounds and the conductive carbon black which are expressed with polyester, the following general formula [III], or [IV].

[Formula 2]



... [III]



... [IV]

(R in a general formula [III] and a general formula [IV] expresses a hydrogen atom, an N-methylene-phthalimide machine, an N-methylene-alkylation phthalimide machine, an N-methylene-alkoxy substitution phthalimide machine, an N-methylene-halogenation phthalimide machine, the alkyl group of carbon numbers 1-20, a phenyl group, an alkylation phenyl group, an alkoxy substitution phenyl group, a phenyl substitution phenyl group, a halogenation phenyl group, and a cycloalkyl machine.)

[Claim 10] The manufacture method of a polyester constituent according to claim 9 that an epoxy compound is at least one sort chosen from N-glycidyl phthalimide or o-phenyl phenyl glycidyl ether.

[Claim 11] The manufacture method of the polyester constituent of a claim 9 and a claim 10 given in any 1 term that carbodiimide compounds are N, N'-G 2, and 6-diisopropyl phenyl carbodiimide.

[Claim 12] polyester -- the jib of a polyethylene terephthalate, a polybutylene terephthalate or a butylene terephthalate unit, a butylene isophthalate unit, and an aliphatic dicarboxylic acid -- the manufacture method of the polyester constituent of the claim 9 which is a kind at least - a claim 11 given in any 1 term chosen from the copolymerized polyester which consists of a CHIREN ester unit

[Claim 13] The manufacture method of a monofilament characterized by extending [ spinning ] and heat setting the polyester constituent obtained by the method of a claim 9 - a claim 12 given in any 1 term.

[Translation done.]

\* NOTICES \*

**Japan Patent Office is not responsible for any damages caused by the use of this translation.**

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

**DETAILED DESCRIPTION**

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to industrial use textiles, such as paper-making dryer canvas using the polyester constituent, the monofilament, and this monofilament which combine the outstanding conductivity and adding-water-proof resolvability, a network conveyer for the thermal bond method nonwoven fabric heat adhesion processes, and a filter for screens.

[0002]

[Description of the Prior Art] The thermoplastic polyester, for example, a polyethylene terephthalate, has the outstanding dynamics property and the outstanding chemistry property, and it has been widely used as casts, such as fiber and a film. However, since conductivity of polyester was very low, it originated in static electricity tending to be charged, and had various problems. For example, when the polyester monofilament was used for industrial use textiles, such as fine-particles sieving filters, such as wheat flour, a network conveyer for the thermal bond method nonwoven fabric heat adhesion processes, and dryer canvas of a paper machine, static electricity generated while in use was accumulated on textiles, danger, such as ignition, explosion, etc. by adhesion for the product of dust, rebounding with textiles and a product or poor exfoliation, and the discharge spark, was caused, and it had the fault which causes trouble to operation.

[0003] Various improvement has been tried in order to cope with this problem conventionally. For example, although the industrial use textiles which carried out the union of the metal wires, such as copper wire, to some polyester monofilament textiles are known, since rust is generated in a metal wire or this has the problem of scraping the roller with which textiles contact while in use, it is not practical.

[0004] Moreover, various meanses to give conductivity to a polyester fiber have also been proposed. For example, the conductive bicomponent fiber which the heart becomes from mixture with an aromatic polyester / aliphatic polyester (mixed weight ratio 80 / 20 - 98/2) mixture polymer, and conductive carbon black, and a sheath becomes from an aromatic polyester is proposed (JP,56-85423,A). However, since conductive carbon black did not exist in a sheath component, the monofilament obtained by this method had the problem that conductivity was inadequate.

[0005] Moreover, the polyester product had the problem of being easy to cause hydrolysis under the degree atmosphere of high-humidity/temperature. For example, when a polyester monofilament was used as constituent material of paper-making dryer canvas, in order that a polyester monofilament might cause the on-the-strength fall by hydrolysis degradation while in use, it was difficult to be equal to prolonged use. In order to improve the adding-water-proof resolvability of this polyester, various improvements have been made from the former.

[0006] For example, the method of adding a glycidyl phthalimide in polyester (JP,61-4843,B), How to add an epoxy compound under existence of alkali metal in polyester (JP,61-42728,B), the method (JP,63-8133,B --) of adding an oxazoline compound in polyester Although JP,61-48531,B, JP,61-57182,B, JP,57-161122,B, and JP,61-48532,B are known and the appropriate improvement effect in adding-water-proof resolvability is acquired The adding-water-proof resolvability of the high level

called for now cannot be satisfied.

[0007] Moreover, the method of making the adding-water-proof resolvability of polyester improve is learned by adding a carbodiimide compound. For example, the method of making the filament which adds monochrome or a screw carbodiimide compound, carries out kneading spinning for a short time, and does not contain an unreacted carbodiimide form (JP,50-95517,A), How to add the poly carbodiimide compound which has three or more carbodiimide machines in a molecule (JP,38-15220,B), It acts as the cap of the carboxyl end group at a reaction with a carbodiimide. The monochrome of isolation And/ 30-200 ppm of or screw carbodiimide compounds The polyester fiber and filament (JP,4-289221,A) which contain the resultant containing the poly carbodiimide or the poly carbodiimide machine which has reactivity in addition of isolation at least 0.02% of the weight are proposed. Moreover, various improvements, such as proposing the polyester monofilament for paper-making canvas (JP,58-23916,A) which carried out the amount survival of specification of the manufacture method (JP,57-205518,A) of an industrial use polyester monofilament and the specific carbodiimide compound which add a specific carbodiimide compound in polyester including Lynn of the amount of specification in the unreacted state, have been made.

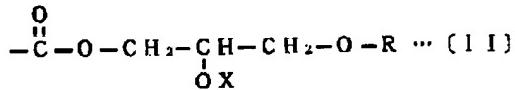
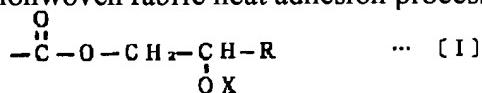
[0008] However, it sets in the polyester which made high-concentration carbon black contain for the purpose which gives the above-mentioned conductivity to polyester. Under the influence of the functional group which the moisture and carbon black of the carbon black origin have When it further becomes easy to understand polyester an added water part, for example, a carbon black content polyester monofilament is used as constituent material of paper-making dryer canvas It has the problem to which can delete while the polyester monofilament which contained carbon black with advance of hydrolysis uses it, and drop out, and the grace of a paper product is made to fall remarkably, and much of the polyester which has the outstanding conductivity and adding-water-proof resolvability was expected.

[0009]

[Problem(s) to be Solved by the Invention] this invention relates to the various industrial use textiles which used the polyester constituent useful as the various industrial use parts which combine the outstanding conductivity and adding-water-proof resolvability, the object for garments and industrial use textile materials, various textiles, etc., the monofilament, and this monofilament, the dryer canvas for paper making and the network conveyer for the thermal bond method nonwoven fabric heat adhesion processes, and the belt for conveyance in a dryer in view of the above-mentioned demand.

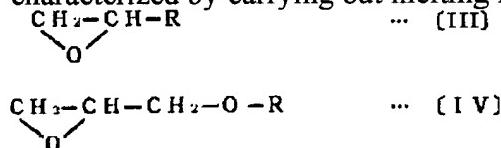
[0010]

[Means for Solving the Problem] The technical problem of said this invention is /106 g 5Eq about at least one sort of end groups as which 1. polyester is expressed in the following general formula [I] or [II]. Above, 0.005 - 1.5 % of the weight and the conductive matter are contained for an unreacted carbodiimide compound. Specific resistance is 108. Paper-making dryer canvas which used at least the polyester constituent, the monofilament, and this monofilament which are below omega-cm in part, Industrial use textiles or [Formula 3], such as a network conveyer for the thermal bond method nonwoven fabric heat adhesion processes, a filter for screens, and a belt for conveyance in a dryer



(R in a general formula [I] and a general formula [II] expresses a hydrogen atom, an N-methylene-phthalimide machine, an N-methylene-alkylation phthalimide machine, an N-methylene-alkoxy substitution phthalimide machine, an N-methylene-halogenation phthalimide machine, the alkyl group of carbon numbers 1-20, a phenyl group, an alkylation phenyl group, an alkoxy substitution phenyl group, a phenyl substitution phenyl group, a halogenation phenyl group, and a cycloalkyl machine, and X expresses a hydrogen atom and a carbodiimide reactive residue.)

2. Contain Conductive Carbon Black Four to 15% of the Weight as Conductive Matter. The paper-making dryer canvas which used a polyester constituent, an above-mentioned monofilament, and this above-mentioned monofilament in part at least, Industrial use textiles, such as a network conveyer for the thermal bond method nonwoven fabric heat adhesion processes, a filter for screens, and a belt for conveyance in a dryer, Or non-reacted 3. carbodiimide compounds are N, N'-G 2, and 6-diisopropyl phenyl carbodiimide. The paper-making dryer canvas which used a polyester constituent, an above-mentioned monofilament, and this above-mentioned monofilament in part at least, Industrial use textiles, such as a network conveyer for the thermal bond method nonwoven fabric heat adhesion processes, a filter for screens, and a belt for conveyance in a dryer, or 4. -- polyester -- the jib of a polyethylene terephthalate, a polybutylene terephthalate or a butylene terephthalate unit, a butylene isophthalate unit, and an aliphatic dicarboxylic acid -- it was chosen out of the copolymerized polyester which consists of a CHIREN ester unit -- it is a kind at least -- The paper-making dryer canvas which used a polyester constituent, an above-mentioned monofilament, and this above-mentioned monofilament in part at least, Industrial use textiles, such as a network conveyer for the thermal bond method nonwoven fabric heat adhesion processes, a filter for screens, and a belt for conveyance in a dryer, Or 5. monofilament is sheath-core compound thread, and it consists of a polyester constituent of at least the above [ a sheath component ] of this sheath-core compound thread. It is the sheath-core compound monofilament which a heart component becomes from the polyester which contains an unreacted carbodiimide compound 0.005 to 1.5% of the weight. The paper-making dryer canvas which used an above-mentioned monofilament and this above-mentioned monofilament in part at least, Industrial use textiles, such as a network conveyer for the thermal bond method nonwoven fabric heat adhesion processes, a filter for screens, and a belt for conveyance in a dryer, Or after carrying out melting kneading of at least one sort of epoxy compounds and the conductive carbon black which are expressed with 6. polyester, the following general formula [III], or [IV]. The manufacture method of the polyester constituent characterized by carrying out melting kneading with a carbodiimide compound, or [Formula 4]



(R in a general formula [III] and a general formula [IV] expresses a hydrogen atom, an N-methylene-phthalimide machine, an N-methylene-alkylation phthalimide machine, an N-methylene-alkoxy substitution phthalimide machine, an N-methylene-halogenation phthalimide machine, the alkyl group of carbon numbers 1-20, a phenyl group, an alkylation phenyl group, an alkoxy substitution phenyl group, a phenyl substitution phenyl group, a halogenation phenyl group, and a cycloalkyl machine.)  
 7. Epoxy Compound is at Least One Sort Chosen from N-Glycidyl Phthalimide or O-Phenyl Phenyl Glycidyl Ether. The manufacture method of the above-mentioned polyester constituent, Or the manufacture method of the above-mentioned polyester constituent that 8. carbodiimide compounds are N, N'-G 2, and 6-diisopropyl phenyl carbodiimide, Or 9. polyester the jib of a polyethylene terephthalate, a polybutylene terephthalate or a butylene terephthalate unit, a butylene isophthalate unit, and an aliphatic dicarboxylic acid -- it was chosen out of the copolymerized polyester which consists of a CHIREN ester unit -- it is a kind at least -- It can attain by the manufacture method of the above-mentioned monofilament characterized by extending [ spinning ] and heat setting the polyester constituent obtained by the manufacture method of the above-mentioned polyester constituent, or the method of 10. above etc.

[0011]

[Embodiments of the Invention] Hereafter, this invention is explained in detail. The polyester (henceforth this polyester) in the polyester constituent and monofilament of this invention is polyester which serves as a dicarboxylic acid from a glycol. As a dicarboxylic-acid component, terephthalic-acid, 2, 6-naphthalene dicarboxylic-acid, isophthalic-acid, 1, and 4-cyclohexane dicarboxylic acid etc. is mentioned. Moreover, as a glycol component, ethylene glycol, propylene-glycol, tetramethylene-glycol,

1, and 4-cyclohexane dimethanol etc. is mentioned. It can be used combining these dicarboxylic-acid components and glycol components suitably. Moreover, a part of above-mentioned dicarboxylic-acid component may be replaced by the adipic acid, the sebacic acid, the dimer acid, the sulfonic-acid metal salt substitution isophthalic acid, etc., and a part of above-mentioned glycol component may be replaced by a diethylene glycol, neopentyl glycol, 1, 4-cyclohexane diol, the polyalkylene glycol, etc.

Furthermore, the little combined use of the chain branching agents, such as a pentaerythritol, a trimethylol propane, trimellitic acid, a trimesic acid, and a boric acid, can also be carried out.

[0012] Also among these, more than 90 mol % of a dicarboxylic-acid component consists of a terephthalic acid. The polyethylene terephthalate which more than 90 mol % of a glycol component becomes from ethylene glycol And more than 90 mol % of a dicarboxylic-acid component consists of a terephthalic acid. (It is hereafter called PET) More than 90 mol % of a glycol component consists of a tetramethylene glycol. A polybutylene terephthalate (henceforth PBT) and a butylene terephthalate unit, and/or a butylene isophthalate unit, And the copolymerized polyester (henceforth copolymerized polyester) which consists of copolymerization components which consist of a dibutyl ester unit of an aliphatic dicarboxylic acid is suitable. Although the copolymerization ratio with a butylene terephthalate unit in case polyester is copolymerized polyester and/or a butylene isophthalate unit, and the dibutyl ester unit of an aliphatic dicarboxylic acid can be chosen arbitrarily, the copolymerization ratio which consists of a butylene terephthalate unit and/or 90 - 98 % of the weight of butylene isophthalate units, and 10 - 2 % of the weight of dibutyl ester units of an aliphatic dicarboxylic acid is desirable.

[0013] Although the limiting viscosity of polyester, such as PET and PBT, should just usually be 0.6 or more, the limiting viscosity [eta] of copolymerized polyester should just usually use 0.3 or more things. The dibutyl ester unit of the dicarboxylic acid of 3-10 methylene numbers is desirable, and the dibutyl ester unit of the aliphatic dicarboxylic acid in copolymerized polyester has a still more desirable dibutyl horse mackerel peat unit also in these.

[0014] A well-known anti-oxidant besides particles, such as various inorganic particles, crosslinked-polymer particles, etc., such as titanium oxide, silicon oxide, a calcium carbonate, CHITSU-sized silicon, clay, talc, a kaolin, and a zirconic acid, a sequestering agent, an ion exchanger, a coloring inhibitor, illuminant-proof, a clathrate compound, an antistatic agent, various coloring agents, waxes, a silicone oil, various surfactants, and various strengthening fiber may be conventionally added by this polyester.

[0015] at least one sort of end groups expressed with the above-mentioned general formula [I] which the polyester in the polyester constituent or monofilament of this invention has, or [II] (It is hereafter called the end group of a general formula [I] and [II]) The end group generated by the reaction of the end carboxyl group of polyester, and a corresponding monochrome epoxide compound, It is the reactive residue of the end group and carbodiimide compound which were generated by the reaction of the end carboxyl group of this polyester, and a corresponding monochrome epoxide compound. As the end carboxyl group of polyester, and a monochrome epoxide compound which has reacted What thing may be used as long as it is the epoxide compound of one organic functions. For example, ethylene oxide, a propylene oxide, butylene oxide, A styrene oxide, N-glycidyl phthalimide, an N-glycidyl-4-methyl phthalimide, N-glycidyl -4, 5-dimethyl phthalimide, an N-glycidyl-3-methyl phthalimide, N-glycidyl -3, 6-dimethyl phthalimide, an N-glycidyl-4-ethoxy phthalimide, An N-glycidyl-4-crawl phthalimide, N-glycidyl -4, a 5-dichloro phthalimide, an N-glycidyl-4-bromine phthalimide, N-glycidyl -4, and 5- a jib -- a ROM phthalimide -- Methyl glycidyl ether, ethyl glycidyl ether, propyl glycidyl ether, Butyl glycidyl ether, the allyl-compound GURIJIJIRU ether, cyclohexyl glycidyl ether, Phenyl glycidyl ether, o-phenyl phenyl GURISHI gel ether, The 2-ethylhexyl GURISHI gel ether, p-tert.-butylphenyl glycidyl ether, Dibromo phenyl glycidyl ether, the condensation reactant of ethylene oxide addition phenols and epichlorohydrin, the condensation reactant of ethylene oxide addition alcohols and epichlorohydrin, etc. can be mentioned (henceforth instantiation monochrome epoxide compounds). Also in these monochrome epoxide compounds, ethylene oxide, a propylene oxide, N-glycidyl phthalimide, phenyl glycidyl ether, and o-phenyl phenyl GURISHI gel ether are desirable, and N-glycidyl phthalimide and o-phenyl phenyl GURISHI gel ether are still more desirable.

[0016] Although the concentration of the end group of the general formula in polyester [I] and [II]

changes with additions of the end carboxyl group concentration and this end carboxyl group which polyester (henceforth raw material polyester) before reacting with a monochrome epoxide compound has, and the monochrome epoxide compound made to react etc., it can be known by the following formula.  $E=C-Ec$  ( $E$  in a formula expresses the concentration (equivalent / 106 g) of the end group of a general formula [I] and a general formula [II]  $Ec$ ) The end carboxyl group concentration (equivalent / 106 g) of polyester after carrying out melting kneading of raw material polyester, a monochrome epoxide compound, and the conductive matter, for example, the carbon black, is expressed.  $C$  is the almost same conditions as the time of carrying out melting kneading of raw material polyester, a monochrome epoxide compound, and the conductive matter, for example, the carbon black. the end carboxyl group concentration (equivalent / 106 g) of polyester after carrying out melting kneading of raw material polyester and the conductive matter, for example, the carbon black, without a monochrome epoxide compound is expressed

Here, end carboxyl group concentration is measured by Pohl by Anal. Chem. and the method indicated by 24 1614 (1954).

[0017] The end group concentration of the general formula [I] in  $E$  in the above-mentioned formula, i.e., polyester, and [II] is /106 g 5Eq. It is /106 g 10Eq that what is necessary is just to be above. It is still more desirable if it is above.

[0018] For the conductivity of the polyester constituent of this invention, specific resistance is 108. It is below omega-cm and is 106. It is desirable in it being below omega-cm, and is 105. It is still more desirable in it being below omega-cm.

[0019] Here, the above-mentioned specific resistance is ASTM about a resin constituent. Although it carries out according to D257 and a monofilament is indicated also during explanation of an example, the pole transcendence \*\*\*\* SM-10E type by Toa Electronics, Ltd. is used, and it measures by inter-electrode sample length of 1cm.

[0020] Specific resistance is 108. The polyester constituent below omega-cm can be attained by making polyester contain the conductive matter. Although various conductive carbon black (henceforth CB), various metal powders and microfilaments, various conductive metallic compounds, various conductive metallic oxides, etc. can be mentioned and it can be used as conductive matter which polyester is made to contain combining one sort of these conductive matter, or two sorts or more, CB is desirable also in these.

[0021] Although anythings can be used if it is CB which has conductivity as CB, the amount of DBP oil supply (the 9g method) is suitable for 340m\*\* / CB 100g or more. As such CB, they are the KETCHIEN black international company make "KETCHIEN black" TMEC and "KETCHIEN black" TMEC600JD. It is known.

[0022] The content of CB in the polyester constituent in the case of using CB as conductive matter is 4 - 15 % of the weight, and is still more desirable in it being 8 - 12 % of the weight. If there are more amounts of CB than the above-mentioned range, the fluidity of a resin will fall, for example, fabrication by melt spinning etc. will become difficult. Moreover, if there are few amounts of carbon black than the above-mentioned range, the conductivity of the monofilament obtained will become inadequate.

[0023] As conductive matter other than CB, for example Moreover, a metal powder, whiskers, and copper sulfide, such as silver, copper, nickel, and iron, Metallic compounds, such as copper iodide and zinc sulfide, the tin oxide which added the antimony oxide, The metallic-oxide particle, the whiskers, and titanium oxide which added metallic oxides, such as an aluminum oxide, a potassium oxide, an indium oxide, and a germanium oxide, such as a zinc oxide, The metal which has the above-mentioned conductivity on front faces, such as a zinc oxide, a magnesium oxide, a tin oxide, an iron oxide, silicon oxide, and an aluminum oxide The particle and the whiskers in which conductive coats, such as metallic compounds and a metallic oxide, were formed can be mentioned, and polyester can be made to usually contain conductive matter other than these CB(s) five to 50% of the weight.

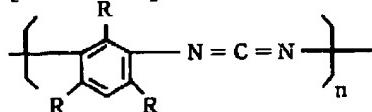
[0024] The polyester which has the end group and the conductive matter of a general formula [I] and [II] in this invention can be obtained by adding in polyester one sort or the initial complement of a compound combined two or more sorts, and carrying out a melting kneading reaction out of the

polyester which has a carboxyl end group, the conductive matter, and a monochrome epoxide compound, or carrying out a melting kneading reaction with a carbodiimide compound further. Although the end carboxyl group concentration level which the end carboxyl group concentration of raw material polyester and the polyester constituent which it is going to obtain, or the polyester of a monofilament has can determine arbitrarily the initial complement of a monochrome epoxide compound at this time, its 10 or less times [ of this chemical equivalent ] amount is desirable more than the chemical equivalent equal to the end carboxyl group concentration which raw material polyester has. However, when the end carboxyl group concentration of raw material polyester is high, it will be necessary to make a monochrome epoxide compound react so much, and the physical properties of the polyester constituent obtained may show a fall inclination. By this meaning, carboxyl group concentration is 100 as raw material polyester. The equivalent / 106 g The following are desirable.

[0025] As an unreacted carbodiimide compound which the polyester constituent or monofilament of this invention contains Although what thing may be used as long as it is the compound which has one piece or two carbodiimide machines or more in 1 molecule For example, N, an N'-G o-Trier carbodiimide, N, an N'-diphenyl carbodiimide, N, an N'-dioctyl desyl carbodiimide, N, N'-G 2, 6-dimethylphenyl carbodiimide, An N-Trier-N'-cyclohexyl carbodiimide, N, N'-G 2, 6-diisopropyl phenyl carbodiimide, N, N'-G 2, a 6-G tert.-butylphenyl carbodiimide, An N-Trier-N'-phenyl carbodiimide, N, an N'-G p-nitrophenyl carbodiimide, N, an N'-G p-aminophenyl carbodiimide, N, an N'-G p-hydroxyphenyl carbodiimide, N, an N'-G cyclohexyl carbodiimide, N, an N'-G p-Trier carbodiimide, A p-phenylene-screw-G o-Trier carbodiimide, a p-phenylene-screw-dicyclohexylcarbodiimide, A hexamethylene-screw-dicyclohexylcarbodiimide, an ethylene-screw-diphenyl carbodiimide, the aromatic poly carbodiimide shown by the following general formula are mentioned (henceforth instantiation carbodiimide compounds).

[0026]

[Formula 5]



(R in a formula expresses a hydrogen atom or the alkyl group of carbon numbers 1-4, and n expresses the integer of 2-20)

Although what is necessary is to choose arbitrarily one sort or two sorts or more of compounds from these instantiation carbodiimide compounds, and just to make polyester contain The compound which has an aromatic skeleton is in an advantageous inclination from the stability after adding in polyester. Especially N, N'-G 2, 6-diisopropyl phenyl carbodiimide, N, N'-G 2, a 6-G tert.-butylphenyl carbodiimide, It is in an inclination with advantageous N, N'-G 2, 6-dimethylphenyl carbodiimide, N, N'-G o-Trier carbodiimide, etc., especially N, N'-G 2, and 6-diisopropyl phenyl carbodiimide (henceforth TIC) are suitable.

[0027] The contents of the unreacted carbodiimide compound in the polyester constituent, polyester fiber, or monofilament of this invention are 0.005 % of the weight or more and 1.5 % of the weight or less. Moreover, the content of an unreacted carbodiimide compound is in a still more desirable inclination with their being 0.01 % of the weight or more and 1.2 % of the weight or less. When there are few contents of an unreacted carbodiimide compound than 0.005 % of the weight, there are few effects of raising adding-water-proof resolvability further, when [ than 1.5 % of the weight ] more, physical properties tend to fall, and it becomes easy to carry out a bleed out and is not more desirable than the inside of a polymer at the time of manufacture of a polyester constituent or a monofilament.

[0028] The content of the polyester constituent said to this invention here or the unreacted carbodiimide compound in a monofilament is measured by the following method.

[0029] (1) \*\*\*\* about 200mg of samples to a 100ml measuring flask.

(2) Add a hexafluoro isopropanol / chloroform (capacity factors 1/1) 2ml, and dissolve a sample.

(3) If a sample dissolves, chloroform 8ml will be added.

(4) You may be 100ml, adding gradually an acetonitrile/chloroform (capacity factors 9/1), and depositing a polymer.

(5) Filter the sample solution by the disk filter of 0.45 micrometers of openings, and carry out quantitative analysis by HPLC. HPLC analysis conditions are as follows.

Column: Inertsil ODS-2 4.6mmx250mm mobile phase: An acetonitrile/water (capacity factors 94/6)

\*\* Amount: 1.5 ml/min

amount of samples: -- 20microl detector: -- UV (280nm)

What is necessary is to add in polyester and just to make this carbodiimide compound of an amount with which this carbodiimide compound that it is [ in the polyester after a reaction ] unreacted, and remains becomes 0.005 % of the weight or more and 1.5% of the weight or less of concentration from end carboxyl group concentration, a reaction condition, etc. of polyester before adding a carbodiimide compound react to the polyester constituent, polyester fiber, or monofilament of this invention, in order to make an unreacted carbodiimide compound contain 1.5 or less % of the weight 0.005% of the weight or more. Manufacture of the polyester constituent of this invention can be obtained by adding in polyester and kneading a monochrome epoxide compound, CB, and a carbodiimide compound in the state of melting.

[0030] As long as it is at least one sort of epoxide compounds expressed with a general formula [III] or [IV] and is the epoxide compound of one organic functions, what thing is sufficient as the monochrome epoxide compound added in polyester, and it can mention the same thing as the aforementioned instantiation monochrome epoxide compound as an example of the epoxide compound which can be used, for example. Also in these monochrome epoxide compounds, ethylene oxide, a propylene oxide, N-glycidyl phthalimide, phenyl glycidyl ether, and o-phenyl phenyl GURISHI gel ether are desirable, and N-glycidyl phthalimide and o-phenyl phenyl GURISHI gel ether are still more desirable.

[0031] Moreover, as long as it is the compound which has one piece or two carbodiimide machines or more in 1 molecule as a carbodiimide compound added in polyester, what thing may be used, and as an example of the carbodiimide compound which can be used, the same thing as the instantiation carbodiimide compounds of the first half can be mentioned, for example. Although what is necessary is to choose arbitrarily one sort or two sorts or more of compounds from these carbodiimide compounds, and just to make polyester contain The compound which has an aromatic skeleton is in an advantageous inclination from the stability after adding in polyester. Especially N, N'-G 2, 6-diisopropyl phenyl carbodiimide, N, N'-G 2, a 6-G tert.-butylphenyl carbodiimide, It is in an inclination with advantageous N, N'-G 2, 6-dimethylphenyl carbodiimide, N, N'-G o-Trier carbodiimide, etc., especially N, N'-G 2, and 6-diisopropyl phenyl carbodiimide (henceforth TIC) are suitable. Moreover, this carbodiimide compound can also be used for polymers, such as polyester and polyolefines, as a master pellet which made 10% of the weight or more of high concentration contain these carbodiimide compounds.

[0032] These epoxide compounds, a carbodiimide compound, the conductive matter, for example, CB, and melting kneading with polyester An epoxide compound, a carbodiimide compound, and the conductive matter, for example, CB, are simultaneously added for the polyester or the polyester chip of a melting state after a polycondensation reaction. How to carry out melting kneading in a polycondensation tub with the inside of a melting kneading tub with a stirrer, or one shaft and a biaxial extruder, For the polyester chip to which the epoxide compound was made to infiltrate or adhere, the conductive matter, For example, although it can carry out by any methods, such as the method of carrying out melting kneading of the carbodiimide compound further, after carrying out melting kneading of the method of adding CB and a carbodiimide compound and carrying out melting kneading, or polyester, an epoxide compound and the conductive matter, for example, the CB, beforehand After especially a desirable method carries out melting kneading of the CB beforehand as polyester, an epoxide compound, and conductive matter, the method of carrying out melting kneading of the carbodiimide compound is mentioned. The reason is considered as follows, although it is not clear.

[0033] In order to suppress hydrolysis of polyester sharply, it is required to inactivate the matter with the operation which promotes hydrolysis of polyester, and a functional group. Moreover, in case polyester

and CB are kneaded, since moisture exists also in CB, it is required to inactivate these. For example, it is required to block the carboxyl group which raw material polyester has, and to continue blocking the carboxyl group which understands an added water part continuously [ while a polyester product uses it ], and is generated one by one. Although it is possible to block the carboxyl group which raw material polyester has by the method of adding an epoxide compound in raw material polyester as this means, since an epoxide compound cannot remain easily due to an unreacted state in a polyester product even if it adds so much, while a polyester product uses it, it lacks in the function which inactivates the carboxyl group which understands an added water part and is generated. On the other hand, by the method of adding a carbodiimide compound in raw material polyester, although a carbodiimide compound has the property which can be unreacted and can exist in polyester, the hydroxyl group of not only a reaction but the polyester with which a carbodiimide compound blocks the carboxyl group in raw material polyester reacts, and it is consumed. Moreover, in order to suppress hydrolysis of the polyester by the moisture in CB kneaded in polyester, even if it provides a means to dry CB in advance, in the moisture in CB, eye a difficult hatchet and a carbodiimide compound react, and removing moisture completely is consumed. Then, in order to make the effective dose of an unreacted carbodiimide compound remain in a polyester product, when it was going to add the carbodiimide compound in polyester so much, the solubility to the polyester of a carbodiimide compound was low, and at the time of fabrication, a bleed out was not able to be carried out from polyester, and it was not able to apply [ there could be the problem of the physical properties of a polyester moldings falling, and ]. However, after blocking the carboxyl group generated because add CB and an epoxide compound in polyester, carry out melting kneading and polyester understands an added water part with the moisture in raw material polyester and CB beforehand first according to the method of the above-mentioned this invention, In order to add a carbodiimide compound and to carry out melting kneading, the initial complement of an unreacted carbodiimide compound remains efficiently in product polyester, and while a polyester product uses it, it is thought that \*\*\*\*\* which continues blocking the carboxyl group which understands an added water part continuously and is generated one by one is made.

[0034] First especially a desirable concrete method in the polyester of the polyester chip dried in heating / reduced pressure conditions, heating inert gas, or heating air etc., or a melting state The arbitrary epoxide compound and arbitrary reduced pressure conditions of a form, such as the shape of a liquid, powder, or flakes, After carrying out melting kneading with an extruder etc. at the temperature beyond the melting point of polyester, carrying out measurement supply of the CB dried in heating inert gas etc., In the polyester which performed cooling, solidification, cutting, etc. if needed After carrying out melting kneading with an extruder at the temperature beyond the melting point of polyester, carrying out measurement supply of the carbodiimide compound of arbitrary forms, such as the shape of a liquid, powder, or flakes, a knockout or the method of injecting and fabricating in arbitrary configurations is mentioned. Although what is necessary is for the polyester in this method, an epoxide compound and melting kneading with CB, or melting kneading with a carbodiimide compound to be the temperature beyond the melting point of polyester, and just to usually perform it for [ for / 20 seconds / - ] 20 minutes, respectively, the adding-water-proof resolvability of the polyester obtained when this melting kneading was performed within for [ 30 seconds ] - 13 minutes is in the inclination used as what was further excellent.

[0035] The monofilament of this invention is a continuous fiber which consists of one single yarn, and the configuration (henceforth a cross-section configuration or a cross section) of a cross section perpendicular to the direction of a fiber axis of this monofilament may have what cross-section configurations, such as the shape of the shape of a circle, flatness, a square, and a half moon, a triangle, the polygon of five or more angles, many foliaceous, and a dog bone, and a cocoon type. When using the monofilament of this invention as constituent material of industrial use textiles, a circle or a flat configuration has the desirable cross-section configuration of this monofilament. Especially, when this monofilament is the warp of the dryer canvas for paper making, what has the flat cross-section configuration of this monofilament is preferably used from a viewpoint of the flat nature of canvas.

[0036] the polyester constituent of this invention which described manufacture of the monofilament of

this invention above -- a well-known method -- spinning and extension -- carrying out - heat -- although it can carry out by setting, after carrying out melting kneading of CB and the epoxide compound beforehand as polyester and conductive matter -- further -- a carbodiimide compound -- melting kneading -- carrying out -- succeedingly -- spinning and extension -- carrying out - heat -- the method of setting is desirable First specifically in the polyester of the polyester chip dried in heating / reduced pressure conditions, heating inert gas, or heating air etc., or a melting state The arbitrary epoxide compound and arbitrary reduced pressure conditions of a form, such as the shape of a liquid, powder, or flakes, After carrying out melting kneading with an extruder etc. at the temperature beyond the melting point of polyester, carrying out measurement supply of the CB \*\* dried in heating inert gas etc., In the polyester which performed cooling, solidification, cutting, etc. if needed An extruder performs melting kneading at the temperature beyond the melting point of polyester, carrying out measurement supply of the carbodiimide compound of arbitrary forms, such as the shape of a liquid, powder, or flakes. It can extrude from a spinneret through the polymer streamline exchange machine succeedingly installed in the extruder point, a filter layer, etc., and can manufacture preferably by the method of performing cooling, extension, and a heat set.

[0037] Moreover, the monofilament of this invention can be a composite construction which makes the polyester constituent of this invention some [ at least ] constituents. It is in the inclination used as that the monofilament excelled [ that ] in intensity that the monofilament of this invention was a compound monofilament. Although it can set up arbitrarily, since the compound weight ratio of the polyester constituent of this invention in the case of a compound monofilament and other polymers becomes that the monofilament excelled [ that ] that it was the range of polymer =90 / 10 - 3/97 besides polyester constituent [ of this invention ]/in the balance of conductivity and intensity, it is in a desirable inclination.

[0038] A thing like drawing 1 as a schematic diagram of the cross section in the monofilament which what form is sufficient as as a form of a compound monofilament, for example, is similar to a circular cross section can be mentioned.

[0039] Since good conductivity is acquired also in these composite constructions with it being the thing of the structure which some polyester constituents of this invention have exposed on the surface of a monofilament, it is desirable as composition thread of the intense use of electrification, such as composition thread, such as paper-making dryer canvas and a network conveyer for the thermal bond method nonwoven fabric heat adhesion processes. In addition, if the outer layer of these monofilaments is covered with the polymer which does not contain conductive carbon black further when presenting the sieving filter use of edible fine particles, such as wheat flour, and rice powder, various starch, with the monofilament of this invention (henceforth surface coating), since the black omission object of the conductive polyester generated rarely can prevent mixing in edible fine particles, it is desirable. As the surface coating method in this case, a well-known duplex or the well-known 3-fold sheath-core compound spinning method, melt coating, wet coating, dipping, etc. are employable.

[0040] As other polymers which form the polyester constituent and composite construction of this invention If it is the thermoplastic polymer of fiber-forming nature, it can choose freely. For example, PET, Polyester, such as PBT, 2, 6-polyethylenenaphthalate, and polycyclohexane dimethano terephthalate Polyolefines, such as polyamides, such as nylon 6 and Nylon 66, polyethylene, and polypropylene Polycarbonates and polyphenylene sulfides can be mentioned, especially, polyester, such as PET, PBT2, 6-polyethylenenaphthalate, and polycyclohexane dimethano terephthalate, is desirable, and PET is still more desirable.

[0041] Also in the compound monofilament which consists of such combination, especially the sheath-core compound monofilament which a sheath component becomes from the polyester constituent of this invention at least, and a heart component becomes from the polyester of a monofilament which contains an unreacted carbodiimide compound 0.005 to 1.5% of the weight is desirable.

[0042] The carbodiimide compound illustrated as a carbodiimide compound which can contain the polyester constituent of this invention can be used for the unreacted carbodiimide compound contained in the polyester of the heart component in this sheath-core compound monofilament, and especially its

TIC is desirable.

[0043] It can \*\* manufacture of the polyester used for this heart component carrying out the measurement blend of the master polyester which contains a carbodiimide compound in the method of carrying out melting kneading while carrying out initial-complement measurement supply of the carbodiimide compound at dry polyester, or dry polyester, and performing it by the method of carrying out melting kneading etc.

[0044] Although manufacture of this sheath-core compound monofilament can use the polyester constituent of this invention as a sheath component, can use the polyester which contains an unreacted carbodiimide compound 0.005 to 1.5% of the weight as a heart component and can be performed by the well-known sheath-core compound spinning method As a desirable method, the compound spinning machine equipped with two sets of the extruders for a heart component and sheath components is used especially. The polyester which has the end group of the general formula [I] which carried out melting kneading of polyester, an epoxide compound, and the CB beforehand, and [II] in the extruder for sheath components, Melting kneading is carried out, carrying out melting kneading, carrying out measurement supply of the carbodiimide compound, and carrying out measurement supply of polyester and the carbodiimide compound simultaneously at the extruder for heart components. It extrudes from the sheath-core compound pack and mouthpiece which were successingly prepared at the nose of cam of an extruder, and the method of extending [ cooling ] and heat setting is mentioned.

[0045] Conductivity and adding-water-proof resolvability are superior to the conventional thing, and the monofilament of this invention obtained in this way has them as composition thread for the destaticization of various industrial use textiles, such as paper-making dryer canvas, a network conveyer for the thermal bond method nonwoven fabric heat adhesion processes, a filter for screens, and a conveyance belt in a dryer. [ useful ]

[0046] Here, paper-making dryer canvas is textiles used as various textiles, such as plain weave, double-cloth and \*\*\*\*\*\*, and spiral structure, in order to dry paper within the dryer of a paper machine. Moreover, the network conveyers for heat adhesion processes of the thermal bond method nonwoven fabric are the textiles for passing a nonwoven fabric all over a furnace, in order to make heat adhesive property fiber like the polyethylene of the low melting point which constitutes a nonwoven fabric weld, and they are textiles, such as plain weave and double-cloth. Moreover, the filters for screens are textiles, such as plain weave for using and dividing various fine particles, such as edible fine particles, such as wheat flour, rice powder, and starch, carbon black, and inorganic, organic chemical fine particles. Moreover, the belts for conveyance in a dryer are textiles, such as \*\*\*\*\*\*, such as plain weave for passing through the inside of a dryer or a heat setting machine, and conveying an object for the purpose dried or heat-treated, a duplex, and \*\*\*\*\*\*, and spiral structure.

[0047] The monofilament of this invention is used for some of woof which constitutes the various above-mentioned industrial use textiles, or warp [ at least ]. As a use form, what form is sufficient, for example, it can use for the woof and the whole warp, or can be used for the woof or warp two or more [ every / the usual monofilament, alternation or ].

[0048] The polyester constituent and monofilament of this invention Polyethylene, polypropylene, the poly methyl pentene, an annular olefin system polymer, A polybutene -1, the poly pentene, the Polly 3-methylbutene -1, and the polyolefines of Polly 4-methyl pentene-1 grade And atactic structure polystyrene, isotactic structure polystyrene, Syndiotactic structure polystyrene, a Polly p-methyl styrene, The copolymer of styrene and p-methyl styrene, the Polly alpha-methyl-styrene system polymer, etc. reach polystyrene. A polymethylmethacrylate, polyethyl methacrylate, poly n-propyl methacrylate, Poly n-butyl methacrylate, poly n-octyl methacrylate, Polymethacrylate system polymers, such as poly n-desyl methacrylate and poly n-tetradecyl methacrylate, Denaturation polyolefines, such as a copolymer of various alpha olefins and unsaturation acid glycidyl ester Ethylene vinyl system copolymers, such as ionomers, ethylene and a vinyl chloride copolymer, and an ethylene vinylacetate copolymer Petroleum resins besides a terpene resin, polyacetal resin, a styrene acrylonitrile copolymer, A styrene maleic anhydride copolymer, styrene and an anhydrous maleimide copolymer, one sort of polymers, such as polyamides, such as a cumarone indene copolymer, polyphenylene ethers, polyphenylene sulfides,

polycarbonates, nylon 6, and Nylon 66, -- independence -- or two or more sorts may be combined and you may contain By containing these polymers, since adding-water-proof resolvability becomes what was further excellent, it is desirable.

[0049] Also in the above-mentioned polymer which can be made to contain, polyolefines, polystyrene, and a polymethacrylate system polymer are much more desirable, and it is in a suitable inclination to use an annular olefin system polymer in polyolefines.

[0050] An annular olefin system polymer given [ as an annular olefin system polymer ] in JP,7-258524,A, For example, a two or more carbon numbers [ which make ethylene a principal component ] alpha olefin, a bicyclo [2.2.1] hept-2-en, and a random copolymer with the derivative The ring-opening-polymerization object, the ring breakage copolymer, or its hydrogenation object of a bicyclo (hereafter called ethylene and annular olefin random copolymer) [2.2.1] hept-2-en and its derivative It can mention (it is hereafter called the ring-opening-polymerization object, the ring breakage copolymer, or its hydrogenation object of an annular olefin).

[0051] Ethylene and an annular olefin random copolymer, an annular olefin ring-opening-polymerization object, an above-mentioned ring breakage copolymer, or its above-mentioned hydrogenation object can come to hand as commercial elegance as Appel TM (Mitsui Petrochemical Industries, Ltd. product), ZEONEKKUSU TM (Nippon Zeon Co., Ltd. product), ATON TM (Japan Synthetic Rubber Co., Ltd. product), etc.

[0052] The rate of a blend in the case of making the polyester constituent or monofilament of this invention contain the above-mentioned polymer has 0.2 - 30 % of the weight in a still more desirable inclination to a polyester constituent or a monofilament with it being desirable and being 1 - 15 % of the weight.

[0053] Moreover, the polyester constituent or monofilament of this invention is the purpose which improves the antifouling property (hydrofuge and oil repellency) other than the above-mentioned polymer, and may make well-known fluororesin contain. What thing may be used if it is the polymer which has a fluorine atom in a molecule as fluororesin in this case. For example, ethylene and an ethylene tetrafluoride random copolymer (henceforth ETFE), Poly ethylene tetrafluoride, ethylene tetrafluoride, and 6 fluoride [ propylene ] fluoride vinylidene random copolymer (It is hereafter called 4 F.6 F.2F copolymer), a polychlorotrifluoroethylene resin, A chlorotrifluoroethylene ethylene copolymer, a polyvinylidene fluoride, A vinylidene fluoride tetrafluoroethylene copolymer, a tetrafluoroethylene perfluoroalkyl vinyl ether copolymer, Fluororesin and polyperfluoro alkyl acrylate which have a fluorine atom mainly in the principal chain of a polymer molecule, such as a tetrafluoroethylene hexafluoropropylene copolymer, Polyperfluoro alkyl methacrylate, As the acrylate and/or methacrylate which were included when perfluoroalkyl acrylate and/or perfluoroalkyl methacrylate, and a hydroxyalkyl machine were contained, random or a block copolymer, The fluororesin which has a fluorine atom is mentioned to the side chain of polymer molecules, such as polyester which contains an o- or m-perfluoro oxy-isophthalic acid in a part of dicarboxylic-acid component [ at least ], or polyether polyester. One sort or two sorts or more of compounds can be arbitrarily chosen from these, and polyester can be made to contain. Also in these fluororesin, ETFE and 4 F.6 F.2F copolymer are in a desirable inclination.

[0054] The rate of a blend in the case of making the polyester constituent or monofilament of this invention contain the above-mentioned fluororesin has 0.2 - 30 % of the weight in a still more desirable inclination to a polyester constituent or a monofilament with it being desirable and being 1 - 15 % of the weight.

[0055] Moreover, the polyester constituent of this invention can be preferably used for various clothing, various filters, electronic parts, autoparts, a film, a sheet, etc. as a multifilament, a nonwoven fabric, a staple fiber, and which curdy fiber besides the above-mentioned monofilament and various industrial use textiles.

[0056]

[Example] Hereafter, an example explains this invention in more detail. The steaming-proof sex test of the monofilament in the following examples, the adding-water-proof resolvability examination of a

monofilament, measurement of specific resistance, and measurement of the band voltage at the time of a run of textiles are measured by the method shown below.

[0057] After putting a <steaming-proof [ of a monofilament ] sex-test> monofilament, or textiles into the 100l. autoclave and processing for ten days, for 12 days, and for 15 days in 121-degree-C saturated steam, the strong force of the monofilament after this processing was measured, and it asked for the powerful retention compared as the monofilament before processing is powerful (henceforth powerful retention). It expresses that there is so little hydrolysis degradation that powerful retention is high.

[0058] The <adding-water-proof [ of a monofilament ] resolvability examination> monofilament was put into 30 cc of water, and the 1l. container made from stainless steel containing air, and was sealed, and the COOH basis concentration of the monofilament after processing in a 160-degree C heat carrier for 2 to 6 hours was measured. It means that adding-water-proof resolvability is excellent, so that there is little COOH basis concentration after this processing.

[0059] The pole transcendence \*\*\*\* SM-10E type by <measurement of specific resistance of monofilament> Toa Electronics, Ltd. was used, and it measured by inter-electrode sample length of 1cm.

[0060] Electrostatic-field measurement opportunity EA-03 by <measurement of band voltage at time of run of textiles> Rion are used, endless textiles are hung on two rollers, and the band voltage at the time of making it run for 2 minutes the speed for 360m/is measured from 10cm distance.

[0061] [eta]0.77, carboxyl group concentration which were dried at 130 degrees C under reduced pressure of 1mmHg as an example 1 and comparison example 1 raw-material polyester for 6 hours (It is hereafter called COOH basis concentration) 41Eq as the PBT chip and monochrome epoxide compound of /106 g (henceforth eq/106 g) DENAKORU TMEX-731 whose a principal component is N-glycidyl phthalimide (Nagase Chemicals incorporated company product) And the "KETCHIEN black" EC dried in 100-degree C nitrogen gas as conductive matter for 6 hours (It is hereafter called EX-731) A biaxial extruder is supplied measuring by the quantitative ratio of PBT/EX-731/KB-EC=87/3/10 by the weight ratio. (It is hereafter called KB-EC) By the method of cutting, after carry out melting kneading for 3 minutes at 275 degrees C, extruding diameter abbreviation phi3mm in the shape of a gut, leading to a cooling water tank, cooling and draining off water in a compressed-air shower It is shown by the general formula [I] of this invention, and has the end group (henceforth an end group [I]) whose R in a formula [I] is N-methylene phthalimide machine, and they are COOH basis concentration 0eq/106 g. CB content pellet (henceforth a CB content reserve low COOH-ized polymer) was obtained.

[0062] subsequently, the CB content reserve low COOH-ized polymer and TIC which were dried at 130 degrees C under reduced pressure of 1mmHg for 6 hours -- a weight ratio -- the reduction in CB content reserve COOH, measuring by the quantitative ratio of a polymer / TIC=100/1.5 1 shaft extruder formula spinning machine was supplied, and the melting polymer by which melting kneading was carried out for 2.5 minutes at 280 degrees C was spun from the spinneret for circular cross sections through the filter layer and streamline exchange machine ("star tick mixer" of U.S. KEMIKKUSU) in a spinning pack through the gear pump. this spinning melting line of thread -- a 80-degree C water bath -- after cooling and a law -- the monofilament which extends and sets [ heat ] at a total of 3 times according to a method, and has a circular cross section with a diameter of 0.4mm was obtained The specific resistance of this monofilament is 3.4x102. It is omega-cm and an unreacted TIC content is 0.137. It was weight % and COOH basis concentration was 0eq/106 g. Moreover, the COOH basis concentration of this monofilament after performing a hydrolysis-proof examination for 2 hours was 7eq(s)/106 g.

[0063] Without adding EX-731 in an example 1 for comparison a PBT chip and KB-EC A biaxial extruder is supplied measuring by the quantitative ratio of PBT/KB-EC=90/10 by the weight ratio. They are COOH basis concentration 60eq/106 g with the method of cutting, after carry out melting kneading for 3 minutes at 275 degrees C, extruding diameter abbreviation phi3mm in the shape of a gut, leading to a cooling water tank, cooling and draining off water in a compressed-air shower. CB kneading polymer was obtained (henceforth CB kneading polymer). COOH basis concentration 60eq/106 g of this CB kneading polymer COOH basis concentration 0eq/106 g of the CB content reserve low COOH-ized polymer in the above-mentioned example 1 The difference showed that 60Eq of concentration of the end

group [I] of the monofilament which is a polyester constituent in an example 1 was /106 g (henceforth eq/106 g). Subsequently, dryness and TIC, and melting kneading, spinning, extension and a heat set were performed like the example 1, and the monofilament which has a circular cross section with a diameter of 0.4mm was obtained. The specific resistance of this monofilament is 5.3x106. It is omega-cm and an unreacted TIC content is 0.000. It was weight % and COOH basis concentration was 24eq (s)/106 g. Moreover, the COOH basis concentration of this monofilament after performing a hydrolysis-proof examination for 2 hours was 125eq(s)/106 g. The contents of an example 1 and the comparison example 1 and a result are shown in Table 1.

[0064] Except having not added TIC in comparison example 2 example 1, it carried out like the example 1 and the monofilament was obtained. A result is \*\*\*\*(ed) to Table 1 with the contents.

[0065] Except having changed the spinneret for circular cross sections in example 2 example 1 into the spinneret for flat cross sections, it carried out like the example 1 and the monofilament was obtained. A result is \*\*\*\*(ed) to Table 1 with the contents.

[0066] Except having changed EX-731 in example 3 example 1 into o-phenyl phenyl GURISHI gel ether (henceforth OPPG), it carried out like the example 1 and the monofilament was obtained. A result is \*\*\*\*(ed) to Table 1 with the contents.

[0067] Except [eta]0.92 and COOH basis concentration having changed the raw material polyester in examples 4-6, three to comparison example 4 examples 1-3, and the comparison examples 1-2 into the PET chip of 15eq(s)/106 g, it carried out like examples 1-3 and the comparison examples 1-2, and the monofilament was obtained. A result is \*\*\*\*(ed) to Table 1 with the contents.

[0068] Except having changed as given [ the PET chip in examples 7-8 and comparison example 5 example 4, and the quantitative ratio of EX-731 ] in Table 1, it carried out like the example 4 and the monofilament was obtained. A result is \*\*\*\*(ed) to Table 1 with the content.

[0069] Except [eta]0.50 which consist of 65.3 % of the weight of butylene terephthalate units, 30.1 % of the weight of butylene isophthalate units, and 4.6 % of the weight of butylene horse mackerel peat units, and COOH basis concentration having changed the PBT chip in an example 9, comparison example 6 example 1, and the comparison example 1 into the copolymerized polyester of 49eq(s)/106 g, it carried out like the example 1 and the comparison example 1, and the monofilament was obtained. A result is \*\*\*\*(ed) to Table 1 with the contents.

[0070] The result of the examples 1-9 shown in Table 1 and the comparison examples 1-6 shows that the monofilament which is the polyester constituent of this invention is excellent in adding-water-proof resolvability conductivity and adding-water-proof resolvability.

[0071]

[Table 1]

試験No.	C B 合成予備低COOH化ポリマまたはC B 混液ポリマの内容					モノフィラメントの内容と結果						
	試料1(%)	CB(KB-EC)	モジオル	試験1、(II)濃度 (eq/10 <sup>6</sup> g)	COOH濃度 (eq/10 <sup>6</sup> g)	TIC濃度 (%)	純度(TIC) 純度(%)	断面 形状	比抵抗 (Ω·cm)	COOH濃度 (eq/10 <sup>3</sup> g)	加水吸収率 COOH濃度 (eq/10 <sup>6</sup> g)	
種類 量(%)	量(%)	量(%)	量(%)									
試験1	PBT	87.0	10.0	EX-731	3.0	60	0	1.5	0.137	円	3.4×10 <sup>2</sup>	0
比較1	PBT	90.0	10.0	-	-	0	60	1.5	0.000	円	5.3×10 <sup>6</sup>	24
比較2	PBT	87.0	10.0	EX-731	3.0	60	0	-	-	円	4.8×10 <sup>2</sup>	11
試験2	PBT	87.0	10.0	EX-731	3.0	60	0	1.5	0.138	扁平	3.0×10 <sup>2</sup>	0
試験3	PBT	87.0	10.0	OPPG	3.0	55	5	1.5	0.106	円	1.2×10 <sup>3</sup>	0
試験4	PET	87.0	10.0	EX-731	3.0	25	0	1.5	0.204	円	5.5×10 <sup>3</sup>	0
比較3	PBT	90.0	10.0	-	-	0	25	1.5	0.000	円	6.9×10 <sup>7</sup>	10
比較4	PET	87.0	10.0	EX-731	3.0	25	0	-	-	円	6.2×10 <sup>3</sup>	9
試験5	PET	87.0	10.0	EX-731	3.0	25	0	1.5	0.203	扁平	5.2×10 <sup>3</sup>	0
試験6	PET	87.0	10.0	OPPG	3.0	13	12	1.5	0.068	円	9.0×10 <sup>3</sup>	0
比較5	PET	99.8	10.0	EX-731	0.4	3	22	1.5	0.003	円	2.8×10 <sup>6</sup>	8
試験7	PET	99.8	10.0	EX-731	0.6	6	19	1.5	0.008	円	8.8×10 <sup>5</sup>	5
試験8	PET	99.4	10.0	EX-731	0.8	11	14	1.5	0.058	円	2.5×10 <sup>4</sup>	2
比較9	光合性 エスチル	87.0	10.0	EX-731	3.0	65	0	1.5	0.102	円	6.2×10 <sup>2</sup>	0
比較10	光合性 エスチル	87.0	10.0	-	-	0	65	1.5	0.000	円	7.1×10 <sup>6</sup>	30
												148

Except having changed as given [ the quantitative ratio of the PBT chip in examples 10-13 and seven to comparison example 14 example 1, and KB-EC ] in Table 2, it carried out like the example 1 and the monofilament was obtained. The contents and a result are shown in Table 2. In addition, in Table 2, a result is \*\*\*\*(ed) with the contents of an example 1. Moreover, it \*\*\*\* to Table 2 by making a result into the comparison examples 9-14 with the contents of the monofilament obtained without adding EX-731 in examples 10-13 and the comparison examples 7-8, in order to know the concentration of the end group [I] in examples 10-13 and the comparison examples 7-8.

[0072] The result shown in Table 1 shows that the monofilament which is the polyester constituent of this invention is excellent in conductivity and adding-water-proof resolvability.

[0073]

[Table 2]

実験No.	CB含有予備低COOH化ポリマまたはCB混練ポリマの内容						モノフィラメントの内容と結果					
	試験用試料 種類 量(回転) 量(回転)	CB(KB-EC) 量(回転)	モノボンダ 種類 量(回転)	端端[I]、[II]量 (eq/10 <sup>6</sup> g)	COOH量 (eq/10 <sup>6</sup> g)	TIC量 (回転)	未反応TIC 量(回転)	断面 形状	比抵抗 (Ω·cm)	COOH量 (eq/10 <sup>6</sup> g)	未反応COOH 量(回転)(eq/10 <sup>6</sup> g)	
実験97	PBT 92.0	5.0	EX-731 3.0	52	0	1.5	0.146	円	2.9×10 <sup>12</sup>	0	4	
実験99	PBT 95.0	5.0	- -	0	52	1.5	0.000	円	5.6×10 <sup>13</sup>	20	122	
実験10	PBT 90.9	6.1	EX-731 3.0	54	0	1.5	0.143	円	7.6×10 <sup>7</sup>	0	5	
実験10	PBT 93.9	6.1	- -	0	54	1.5	0.000	円	2.1×10 <sup>8</sup>	22	124	
実験11	PBT 88.9	8.1	EX-731 3.0	57	0	1.5	0.140	円	4.2×10 <sup>4</sup>	0	6	
実験11	PBT 91.9	8.1	- -	0	57	1.5	0.000	円	3.3×10 <sup>5</sup>	24	127	
実験1	PBT 87.0	10.0	EX-731 3.0	60	0	1.5	0.137	円	3.4×10 <sup>4</sup>	0	7	
実験12	PBT 85.1	11.9	EX-731 3.0	62	0	1.5	0.135	円	3.1×10 <sup>2</sup>	0	7	
実験12	PBT 88.1	11.9	- -	0	62	1.5	0.000	円	9.5×10 <sup>2</sup>	27	132	
実験13	PBT 82.1	14.9	EX-731 3.0	63	0	1.5	0.130	円	1.2×10 <sup>2</sup>	0	9	
実験13	PBT 85.1	14.9	- -	0	63	1.5	0.000	円	5.9×10 <sup>2</sup>	30	141	
実験14	PBT 81.0	16.0	EX-731 3.0	64	0	1.5	(流动性が悪く、纺糸不可能)					
実験14	PBT 84.0	16.0	- -	0	64	1.5	(流动性が悪く、纺糸不可能)					

The concentration of an end group [I] in an example 14 and comparison example 15 example 1 dried at 130 degrees C under reduced pressure of 1mmHg for 6 hours is /106 g 60Eq. The CB content reserve low COOH-ized polymer was prepared. On the other hand, [eta]0.92 and COOH basis concentration which were dried at 150 degrees C under reduced pressure of 1mmHg for 16 hours prepared the PET chip of 15eq(s)/106 g as a polymer for heart components.

[0074] the above-mentioned polymer for heart components, and TIC fused at 80 degrees C as a carbodiimide compound -- a weight ratio -- the object for heart components -- the extruder for heart components of the compound spinning machine which has two sets of phi30mm1 shaft extruders in sheath-cores, and has a compound pack and a concentric circle type compound spinneret was supplied, measuring by the quantitative ratio of a polymer / TIC=100/1.5 TIC simultaneously fused at the above-mentioned polymer for sheath components, and 80 degrees C -- a weight ratio -- the object for sheath components -- the extruder for sheath components in the above-mentioned compound spinning machine was supplied, measuring by the quantitative ratio of a polymer / TIC=100/1.5 After carrying out melting kneading respectively at 280 degrees C within each extruder, spinning, extension, and the heat set were performed for the sheath component and the heart component through the pack and the mouthpiece, and 70/30 and intensity obtained [ the heart / sheath compound weight ratio ] the monofilament whose ductility is 28.5% by 4.2 g/d in the circular cross section whose diameter is 0.4mm. The specific resistance of this monofilament is 4.4×10<sup>3</sup>. It is omega-cm and is the unreacted TIC content of the polymer of the sheath section. It was 0.130 % of the weight, and, similarly the COOH basis concentration of the polymer of the sheath section was 0eq/106 g. Moreover, the unreacted TIC content of the polymer of a core part was 0.20 % of the weight. The powerful retention by the steaming-proof sex-test result of this monofilament was 35% after (66% and 15 days) after 87% and 12 days ten days after (example 14).

[0075] For comparison, as a polymer for sheath components of a sheath-core compound monofilament Carry out compound spinning like an example 14 except having prepared CB kneading polymer in the comparison example 1 which was dried at 130 degrees C under reduced pressure of 1mmHg for 6 hours and which does not contain an end group [I], and in the circular cross section whose diameter is 0.4mm 70/30 and intensity obtained [ the heart / sheath compound weight ratio ] the monofilament whose ductility is 28.7% by 4.3 g/d. The specific resistance of this monofilament is 2.2×10<sup>4</sup>. It was omega-cm. Moreover, when the steaming-proof nature examination of this monofilament was performed, degradation of the monofilament which carried out processing for ten days was intense, and powerful

measurement was impossible.

[0076] examples 15-17 and comparison -- as a model of the network conveyer for the example 16 thermal bond method nonwoven fabric heat adhesion processes, and paper-making dryer canvas The good monofilament of the conductivity acquired in the example 1, and adding-water-proof resolvability, [eta]0.92 and COOH basis concentration carry out melting kneading of the PET chip 100 weight section of 15eq(s)/106 g, and TIC using 1 shaft extruder formula spinning machine, carrying out measurement supply of the 1.5 weight section. The monofilament (henceforth a PET-TIC monofilament) with a diameter of 0.4mm which carried out spinning, extension, and the heat set and which was obtained was used for warp, having arranged it to it by turns, and the plain weave fabric was created to the woof using the PET-TIC monofilament (example 15).

[0077] The network conveyer was created like the example 15 except having changed the monofilament obtained in the example 1 in an example 15 into the monofilament obtained in the example 4 (example 16).

[0078] The network conveyer was created like the example 15 except having changed the monofilament obtained in the example 1 in an example 15 into the good monofilament of the conductivity acquired in the example 14, and adding-water-proof resolvability (example 17).

[0079] The network conveyer which used the monofilament with a diameter of 0.4mm which benefits comparison from PET100% for warp and the woof was created (comparison example 16).

[0080] The network conveyer obtained in examples 15-17 and the comparison example 16 is arranged with 5cm width of face, and the result which measured the band voltage at the time of a run is shown in Table 3.

[0081]

[Table 3]

実施例No.	織物の経糸に用いた モノフィラメント	織物の帶電圧 (V)
実施例1 5	実施例1で得たモノフィラメント	-260
実施例1 6	実施例4で得たモノフィラメント	-440
実施例1 7	実施例1 4で得たモノフィラメント	--550
比較実施例1 6	P E T • T I C モノフィラメント	-25000

---

[Translation done.]